

Claims

1. A semiconductor device comprising a substrate having an insulating layer formed on a surface thereof, a semiconductor material layer located on a surface of the insulating layer, a trench that extends from a surface of the semiconductor material layer through the insulating layer and into the substrate, an insulating liner located on the side walls and the base of the trench, and an in-fill of thermally-conductive material within the insulating liner, wherein the insulating liner, the in-fill material and the distance over which the trench extends into the substrate are such as to promote flow of heat from the semiconductor material layer to the substrate, the insulating liner completely surrounding the in-fill material at least where the trench extends into the substrate, and said distance is at least $1\mu\text{m}$.

10 2. A semiconductor device is claimed in claim 1, wherein said distance lies within the range of from $1\mu\text{m}$ to $5\mu\text{m}$.

15 3. A semiconductor device is claimed in claim 2, wherein said distance lies within the range of from $3\mu\text{m}$ to $5\mu\text{m}$.

20 4. A semiconductor device as claimed in any one of claims 1 to 3, wherein there are two trenches, each of which has the features defined in claim 1, and wherein an active device is formed in the semiconductor material layer between the two trenches.

25 5. A semiconductor device as claimed in any one of claims 1 to 4, wherein there are a plurality of trenches, each of which has the features defined in claim 1, and wherein a respective active device is formed in the semiconductor material layer between each pair of adjacent trenches.

30 6. A semiconductor device as claimed in any one of claims 1 to 5, wherein the semiconductor material layer is a silicon layer.

7. A semiconductor device as claimed in claim 6, wherein the silicon layer is of single crystal formation.

8. A semiconductor device as claimed in any one of claims 1 to 7, wherein the substrate is a silicon substrate.

9. A semiconductor device as claimed in any one of claims 1 to 8, wherein the insulating layer is a silicon oxide layer.

10 10. A semiconductor device as claimed in any one of claims 1 to 9, wherein the or each liner is constituted by an outer layer of silicon oxide and an inner layer of silicon nitride.

15 11. A semiconductor device as claimed in claim 10, wherein the or each outer silicon oxide layer has a thickness of substantially 1,000 Å, and the or each inner silicon nitride layer has a thickness of substantially 300 Å.

12. A semiconductor device as claimed in any one of claims 1 to 11, wherein the in-fill material is polysilicon.

20 13. A semiconductor device as claimed in claim 12, wherein the width of the or each trench is substantially 0.8 µm.

25 14. A semiconductor device as claimed in any one of claims 1 to 13, wherein the thickness of the or each liner is at least an order of magnitude less than the thickness of the insulating layer.

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